

What is claimed is:

1. A method for detecting a position of a lane marker provided on a  
5 road surface, comprising steps of:

photographing an image of the road surface by a camera loaded on  
a vehicle;

converting the image of said road surface taken by said camera into  
an overlooked image;

10 obtaining an integral brightness by integrating a brightness of a  
coordinate in a direction perpendicular to a direction of a road width of  
said road surface that is indicated on the converted overlooked image  
and detecting the integral brightness in every coordinate which is in said  
road width direction; and

15 obtaining a position of said road surface corresponding to the  
coordinate in said road width direction in that a high integral brightness  
is indicated.

2. A method for detecting a position of a lane marker provided on a  
20 road surface, comprising steps of:

photographing an image of the road surface by a camera loaded on  
a vehicle;

converting the image taken by said camera into an overlooked  
image;

25 obtaining an integral brightness by integrating a brightness of a  
coordinate in a direction perpendicular to a direction of a road width of  
said road surface that is indicated by the converted overlooked image,

and detecting the integral brightness in every coordinate in said road width direction;

obtaining a width of a group of coordinate which the coordinate in which a high integral brightness is indicated in said road width direction and a coordinate proximity to the coordinate and which indicate a higher integral brightness than the other coordinate; and

obtaining a position of said road surface corresponding to said group of coordinate if said coordinate width corresponds to a specified value of said lane marker when comparing said coordinate width and the specified value of said lane marker in said road width direction.

3. The method according to claim 1, further comprising steps of:

obtaining the coordinate in said road width direction indicating the high integral brightness in the other coordinate except for a coordinate in said road width direction indicating a highest integral brightness and a coordinate proximity to thereto;

thereby carrying out the detection of the position of the lane marker again.

20 4. An apparatus for detecting a position of a lane marker comprising:

overlooked view converting means for converting an image of a road surface that is taken by a moving vehicle into an overlooked image;

brightness profile creating means for creating a brightness profile by obtaining an integral brightness which is obtained by integrating a brightness of a coordinate in a direction perpendicular to a road width direction of said road surface in said converted overlooked image and by detecting the integral brightness in every coordinate in said road width

direction;

high brightness coordinate detecting means for obtaining the coordinate in said road width direction indicating a high integral brightness from the brightness profile; and

5 road surface position detecting means for obtaining a position of said road surface corresponding to the coordinate obtained by the high brightness coordinate detecting means; wherein

10 said apparatus detects said position of the lane marker by the position of said road surface obtained by said road surface position detecting means.

5. An apparatus for detecting a position of a lane marker comprising:  
overlooked view converting means for converting an image of a road surface taken by a moving vehicle into an overlooked image;

15 brightness profile creating means for creating a brightness profile by obtaining an integral brightness which is obtained by integrating a brightness of a coordinate in a direction perpendicular to a road width direction of said road surface in said converted overlooked image and by detecting the integral brightness in every coordinate in said road width  
20 direction;

high brightness coordinate detecting means for obtaining a width of a group of coordinate which the coordinate in which a high integral brightness is indicated in said road width direction and a coordinate proximity to the coordinate and which indicate a higher integral  
25 brightness than the other coordinate from the brightness profile; and

road surface position detecting means for obtaining a position of said road surface corresponding to said group of coordinate if said

coordinate width corresponds to a specified value of said lane marker when comparing said coordinate width and the specified value of said lane marker in said road width direction; wherein

5        said apparatus detects said position of the lane marker by the position of said road surface obtained by said road surface position detecting means.

6.      The apparatus according to claim 4, further comprising:

10     overlooked image compressing means for compressing the converted overlooked image by said overlooked view converting means in the direction perpendicular to said road width direction after deleting a part other than the road surface; wherein

15     said brightness profile creating means creates said brightness profile by using the overlooked image which is compressed by said overlooked image compressing means.

7.      The apparatus according to claim 4, further comprising:

20     amended overlooked image creating means for creating an amended overlooked image which is a vehicle width of said moving vehicle in the overlooked image and having deleted a part of the image extending in a direction of the vehicle traveling from the converted overlooked image by said overlooked view converting means; wherein

25     said brightness profile creating means creates said brightness profile by using the amended overlooked image which is created by said amended overlooked image creating means.

8.      The apparatus according to claim 4, wherein:

5        said brightness profile creating means creates said brightness profile by turning said overlooked image so that the direction perpendicular to the road width direction of said road surface and a direction of a scanning line of said overlooked image to coincide and by obtaining the integral brightness in every said scanning line.

9. The apparatus according to claim 8, wherein:

10        said brightness profile creating means has an analog integration circuit;

10        said analog integration circuit obtains the integral brightness in said scanning line when said overlooked image is constituted by an analog data.

10. The apparatus according to claim 8, wherein:

15        said brightness profile creating means has a full adder;

      said full adder obtains the integral brightness in said scanning line when said overlooked image is constituted by a digital data.

11. The apparatus according to claim 4, further comprising:

20        integral brightness extracting means for extracting only the integral brightness which is over a certain value in said brightness profile by applying a high pass filter to the brightness profile which is created by said brightness profile creating means; wherein

25        said high brightness coordinate detecting means obtains said coordinate which is indicated the high integral brightness among the integral brightness which is extracted by said integral brightness extracting means.

12. The apparatus according to claim 4, wherein:

5        said high brightness coordinate detecting means obtains the coordinate of a position of inflection point in said brightness profile by applying a differential filter to the brightness profile which is created by said brightness profile creating means; and

10      said road surface position detecting means obtains the position of the road surface of said lane marker and a lane width of said lane marker based on the coordinate of said position of inflection point which is obtained by said brightness profile creating means.

13. The apparatus according to claim 4, wherein:

15      said high brightness coordinate detecting means obtains the coordinate indicated the high integral brightness by sequentially detecting the integral brightness of the brightness profile which is created by said brightness profile creating means using a low pass filter.

14. The apparatus according to claim 4, further comprising:

20      lane model memorizing means for memorizing a plurality of lane models in which a line width of a lane marker and a space of an adjoining lane marker are different; wherein

25      said road surface position detecting means extracts the lane model which correspond to a lane condition in said road surface from the lane model that is memorized by said lane model memorizing means by the space of the coordinate obtained by said high brightness coordinate detecting means and detects the position of said lane marker in consideration of the space of the lane marker of extracted lane model and

the line width.

15. The apparatus according to claim 14, wherein:

when said high brightness coordinate detecting means is obtained  
5 the coordinate indicating the high integral brightness and a plurality of  
neighboring coordinate indicating a lower integral brightness than the  
integral brightness of the coordinate indicating the high integral  
brightness from said brightness profile, said road surface position  
detecting means extracts said lane model from said lane model  
10 memorizing means and detects the lane marker corresponding to said  
coordinate indicating the high integral brightness from the extracted  
lane model, thereby detecting a position of adjoining interspaced lined  
lane marker by a relation between said lane model and said coordinate  
indicating the low integral brightness based on the lane marker.

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16 An alarm apparatus for a lane deviation comprising:

a device for detecting a position of a lane marker;

distance calculating means for calculating a distance between a  
moving vehicle and a lane marker which is nearest to the moving vehicle  
20 by the position of the lane marker that is detected by said device for  
detecting the position of the lane marker;

first alarm raising means for raising a different alarming sound to  
a driver corresponding to the distance calculated by said distance  
obtaining means;

25 said device for detecting the position of the lane marker comprised  
of overlooked view converting means for converting an image of a road  
surface that is taken by the moving vehicle into an overlooked image;

5        brightness profile creating means for creating a brightness profile by obtaining an integral brightness which is obtained by integrating a brightness of a coordinate in a direction perpendicular to a road width direction of said road surface in said converted overlooked image and by detecting the integral brightness in every coordinate in said road width direction;

10        high brightness coordinate detecting means for obtaining the coordinate in said road width direction indicating a high integral brightness from the brightness profile; and

15        road surface position detecting means for obtaining a position of said road surface corresponding to the coordinate obtained by the high brightness coordinate detecting means.

17. An alarm apparatus for a lane deviation comprising:

15        a device for detecting a position of a lane marker;

20        lane marker detecting means for obtaining a lane marker which is most nearest to a moving vehicle by the position of the lane marker that is detected by said device for detecting the position of the lane marker;

25        traversing speed detecting means for detecting a traversing speed of said moving vehicle;

30        second alarm raising means for raising an alarm to a driver when said moving vehicle moved to a side of the lane marker that is detected by said lane marker detecting means and when the traversing speed of said moving vehicle is over a predetermined speed;

35        said device for detecting the position of the lane marker comprised of overlooked view converting means for converting an image of a road surface that is taken by the moving vehicle into an overlooked image;

brightness profile creating means for creating a brightness profile by obtaining an integral brightness which is obtained by integrating a brightness of a coordinate in a direction perpendicular to a road width direction of said road surface in said converted overlooked image and by 5 detecting the integral brightness in every coordinate in said road width direction;

high brightness coordinate detecting means for obtaining the coordinate in said road width direction indicating a high integral brightness from the brightness profile; and

10 road surface position detecting means for obtaining a position of said road surface corresponding to the coordinate obtained by the high brightness coordinate detecting means.

18. An alarm device for a lane deviation comprising:

15 a device for detecting a position of a lane marker; lane distance detecting means for obtaining a lane marker which is nearest to a moving vehicle and a distance to the lane marker by the position of the lane marker that is detected by said device for detecting the position of the lane marker;

20 traversing speed detecting means for detecting a traversing speed of said moving vehicle;

first alarm raising means for raising a different alarming sound to a driver corresponding to the distance obtained by said lane distance detecting means; and

25 second alarm raising means for raising an alarm to the driver when said moving vehicle moved to a side of the lane marker that is detected by said lane distance detecting means and when the traversing speed of

said moving vehicle is over a predetermined speed; wherein

        said first alarm raising means discontinues said alarming when a situation that said distance is below of a predetermined distance is continued for a predetermined time or a predetermined moving distance;

5       said second alarm raising means carries out an alarming to said driver after the alarming of said first alarm raising means is discontinued;

      said device for detecting the position of the lane marker comprised of overlooked view converting means for converting an image of a road

10      surface that is taken by the moving vehicle into an overlooked image;

      brightness profile creating means for creating a brightness profile by obtaining an integral brightness which is obtained by integrating a brightness of a coordinate in a direction perpendicular to a road width direction of said road surface in said converted overlooked image and by detecting the integral brightness in every coordinate in said road width direction;

      high brightness coordinate detecting means for obtaining the coordinate in said road width direction indicating a high integral brightness from the brightness profile; and

20       road surface position detecting means for obtaining a position of said road surface corresponding to the coordinate obtained by the high brightness coordinate detecting means.

19. An alarm apparatus for a lane deviation comprising:

25       a device for detecting a position of a lane marker;

      distance calculating means for calculating a distance between a moving vehicle and a lane marker which is nearest to the moving vehicle

by the position of the lane marker that is detected by said device for detecting the position of the lane marker;

traversing speed detecting means for detecting a traversing speed of said moving vehicle;

5       third alarm raising means for raising an alarm to a driver when a calculated time is below of a predetermined time by calculating the time until said moving vehicle deviates said lane marker by using said distance calculated by said distance calculating means and said traversing speed detected by said traversing speed detecting means;

10       said device for detecting the position of the lane marker being comprised of overlooked view converting means for converting an image of a road surface that is taken by the moving vehicle into an overlooked image;

15       brightness profile creating means for creating a brightness profile by obtaining an integral brightness which is obtained by integrating a brightness of a coordinate in a direction perpendicular to a road width direction of said road surface in said converted overlooked image and by detecting the integral brightness in every coordinate in said road width direction;

20       high brightness coordinate detecting means for obtaining the coordinate in said road width direction indicating a high integral brightness from the brightness profile; and

25       road surface position detecting means for obtaining a position of said road surface corresponding to the coordinate obtained by the high brightness coordinate detecting means.

20. The alarm apparatus for a lane deviation according to claim 17,

wherein

    said moving vehicle is provided with a velocity sensor for detecting a vehicle velocity and a steering angle sensor for detecting a steering angle of a steering wheel; and

5      said traversing speed detecting means detects said traversing speed based on the vehicle velocity detected by the velocity sensor and the steering angle detected by the steering angle sensor.

21. The alarm apparatus for a lane deviation according to claim 17,

10     wherein

    said traversing speed detecting means detects said traversing speed by measuring a temporal change of the distance calculated by said distance calculating means.

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